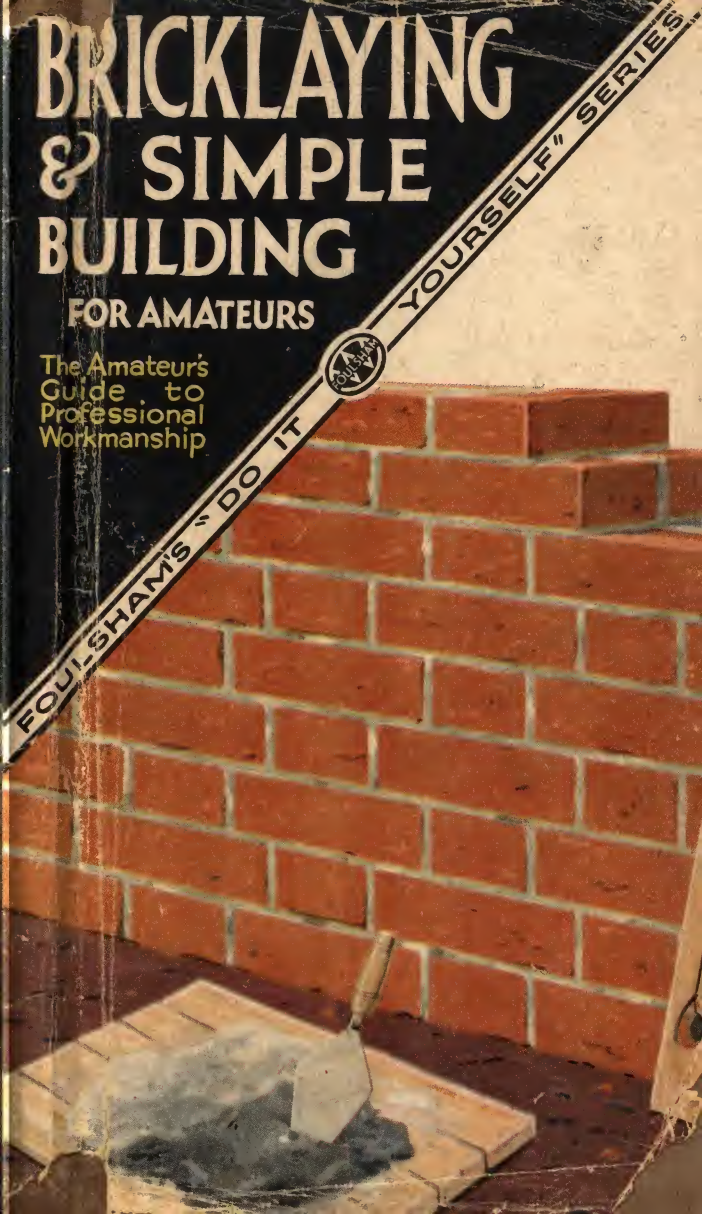
BRICKLAYING & SIMPLE BUILDING

FOR AMATEURS

The Amateur's Guide to Professional Workmanship

FOULSHAM'S "DO IT YOURSELF" SERIES



THE Do It Yourself SERIES

BRICKLAYING AND SIMPLE BUILDING FOR AMATEURS

BY

F. GARDNER

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PREFACE

BRICKLAYING or building with bricks is by no means a difficult art to acquire. Many amateurs consider it easier than constructing in wood. A little patience, and proper attention to the rules, is all that is necessary. Certainly, no handyman need look upon the work as beyond his capabilities if he studies the hints set out in the pages which follow.

The necessary tools or equipment are few and not costly. The materials are readily procured from the nearest builders' merchant, who will deliver them at your door. In fact, there is nothing to stand in the way of constructing that garage, shed, outhouse, or other brick construction, which will add so much to your comfort. There are dozens of things, in and around the house, that you can easily erect or rebuild. Why not try your hand at what is really a very fascinating and money-saving pastime?

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BRICKLAYING AND SIMPLE BUILDING FOR AMATEURS

Preliminary Caution

In many localities, if not all, there are certain restrictions imposed on brick buildings. Whatever work is erected must conform to these local regulations. Therefore, before any building is commenced, it is advisable to get into communication with the surveyor, who will give instructions on the matter. This applies more to the erection of new structures than to the repair and alteration of old ones; and more to outdoor than indoor work.

These local regulations need not deter anyone from embarking on a piece of amateur building. They will merely require the fulfilment of certain conditions which, if known at the outset, may be complied with quite easily.

Weather Conditions

Bricklaying or the laying of concrete should never be undertaken in frosty weather. If this caution is neglected the work will probably develop cracks and be ruined.

A long spell of wet weather may, also, turn a good job into a bad one. A shower, however, is no great drawback if the top courses of bricks are temporarily covered with sacking or other similar material. But, generally speaking, it is best to delay outdoor work when wet weather is expected.

How to Begin

Let us suppose, for the purpose of illustration, that the reader would like to build a garage on the ground surrounding his house. How should he set to work? The first thing will be to decide on the dimensions of the proposed erection. They will depend on the space of land at his disposal and the size of the car to be housed. He should not plan for less than two feet of elbow room on either side of the car to permit of cleaning, repairing, etc., if such is possible—more, if he can. Any extra space available can be profitably utilised by a work bench, a store cupboard, or other useful fitting.

The next step is to obtain a large sheet of paper and to draw on it the shape of the floor, the four walls and the roof. If possible, these should be done to scale, say a half or one inch to the foot; but this is not absolutely necessary, and a sketch giving an idea of the shape, with the measurements marked on it, will do almost as well.

The reader is now in a position to approach the local surveyor, to show the plans and to tell him what it is proposed to do. The surveyor may make stipulations and will often give helpful advice. He should be approached some little time before the actual work is to be started, because local authorities will only deal with the scheme in a routine manner.

The Materials

When the plans are passed, consideration must be given to the materials. Builders' merchants are usually to be found close to a railway siding or a water-way. Quotations should be obtained for Fletton bricks and stock bricks, per thousand. The former are a little cheaper than the latter. Both are quite ordinary bricks, suitable for hard wear, but they are in no way ornamental. If the cost

is not counted and there is a keen desire to make the building appear attractive, then red bricks, which cost about fifty per cent. more, should be ordered.

A quantity of sand will be wanted. It is sold by the cubic yard, by the sack or the bushel, according to whether large or small amounts are needed. Clearly, in the case of building a garage, it should be purchased by the yard—a yard being the usual cartload.

The sand ought to be clean and sharp: that is to say, it ought not to be sticky, which is a sign that it contains clay or some other undesirable ingredient. Never get sea sand, as the salt it contains will cause the walls to be perpetually damp.

In addition, some sacks of Portland cement or lime will be needed. Cement is sold by the ton, the sack, the bushel, or the bag. For the amateur builder the sack is usually the most convenient form.

It is useless for us to suggest the prices of these materials, because they differ considerably in different localities and at various times. What the reader should be careful to do is to ask for prices, including delivery.

When the materials arrive, they should not be dumped down on the very spot where the building is to be erected, but close by. It is no easy task to shift a thousand bricks or so, and two or three cartloads of sand.

Quantities

The amateur bricklayer must not go out and buy a lot of bricks, a lot of sand, and a lot of lime or cement. First of all, he should form some idea of the quantities that will actually be required. This is not difficult if he will sit down for a few minutes and do a little sum.

As far as the bricks are concerned, it should be remembered that those made for ordinary purposes are of a standard size, which is nominally, 8¾ inches long, 4¼ inches broad, and 2¾ inches thick. When set in mortar, they may be reckoned as 9 inches, by 4½ inches, by 3 inches.

Now, it is quite clear that the number of bricks required depends not only on the area of the walls to be erected, but on their thickness as well. If the bricks are to be fitted together end to end, in long lines, the wall will be as thick as the breadth of a brick, or 4½ inches (4¼ inches actual). Such walls are said to be half a brick thick. But, if the bricks are fitted together side to side, the wall will be as thick as the length of a brick or 9 inches (8¾ inches actual). Such walls are said to be one brick thick. Other walls are spoken of as being one and a half, and others, again, as two bricks thick; but the reader will seldom deal with them, as half a brick and one brick walls are quite stout enough for anything that is likely to be undertaken by an amateur.

From the above, it will be seen that, if a wall is to be erected half a brick thick, four bricks, placed end to end, will be wanted to fill the space of a yard long, and twelve laid one on top of the other, to fill a yard high. This gives a total of 48 bricks required for a square yard of wall face. Twice this number when it is one brick thick, and so on.

With this data, it should be quite easy to reckon, with fair precision, the number of bricks required for any individual job. Allowance must be made, however, for breakages, rejects and other contingencies.

To estimate the quantity of lime and sand, or cement and sand, is not so simple; chiefly because each person may use it in a different manner; but the following allowance is a fair average;

Six bushels of blue lias lime and eighteen bushels of sand for every thousand bricks.

Or six bushels of Portland cement and eighteen bushels of sand per thousand bricks.

Tools and Accessories

The bricklayer can buy his whole kit for a few shillings, if certain household articles are brought into service.

The first necessity is a builder's trowel—two, if they can be afforded; a large twelve inch one for laying the mortar, and a small one for pointing. Quite good trowels are sold for sixpence at Woolworth's and similar stores.

The second requirement is a "hawk," which consists of a flat top of wood, about ten by twelve inches in surface and one inch thick, held in the centre, underneath, by a round rod of wood. There is no need to buy this article as one can be made in a few moments at home.

A third necessity is a "straight-edge," which is a length of wood about four to five feet long, one inch thick and three or four inches wide. This is a very useful piece of apparatus for assisting in getting the bricks into correct position. Say, for instance, that a square pillar is to be erected and a dozen or more courses have already been run up. As each brick is added, this wooden straight-edge is put up against the existing bricks to test the position of the one just laid. (Diagram p. 14.) If the straight-edge does not touch the pillar throughout its entire length, it is a sign that the last arrival juts out too far, and if it touches the existing pillar throughout its length, but does not touch the brick just laid, the latter must be brought forward until it does. A bricklayer can work to the hundredth part of an inch in this way; and the test may be applied not only vertically, but horizontally and

diagonally across the brick courses as they grow. Of course, a "straight-edge" is quite without value if the edges are not true and parallel.

Another requirement is a spirit level, which should be as large as possible. A round one will not be of much use. The kind required is a long one which, when laid on the straight-edge just

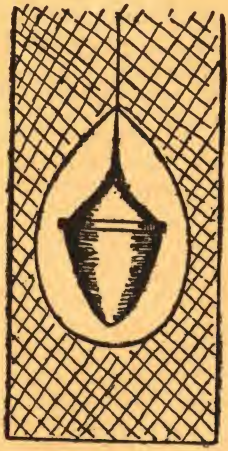
THE WOODEN LATH QUICKLY SHOWS THE BRICKS THAT ARE NOT IN LINE

mentioned, will indicate the slightest inaccuracy of level.

A very handy thing to have is what builders call a plumb rule. It consists of a long line of good twine with a pear-shaped weight at one end. Woolworth's sell the weight for sixpence, and suitable twine may be obtained at any shop that stocks the requirements of anglers. The line is mounted on a straight-edge having an opening in which the bob hangs. (See Diagram on p. 15.)

By placing the straight-edge of this device against the wall, at intervals of about a yard, as the courses are added, the builder is able to ensure that his construction is growing perfectly upright.

If the building is perpendicular, the plumb line will hang absolutely parallel with the sides of the straight-edge. Should it lean one way, the line



PEAR-SHAPED WEIGHT FOR THE PLUMB-RULE

will show the direction in which the adjustment has to be made to the laying of the bricks.

Still another requirement is a line of string, about a dozen yards long, with a metal meat skewer at each end. This will help in getting the brick courses in alignment, as described later.

A chisel and hammer will come into use on many occasions, but these are usually to be found in the regular equipment of any home.

Lime *v.* Cement

We have already hinted elsewhere that the binding material for laying bricks may be either lime or cement, with the addition of sand in both cases. At this point it is necessary to decide which it is intended to use. The case for cement and sand is briefly stated. It is more expensive than lime and sand; perhaps it is a little easier to prepare; but it is certainly a good deal stronger. For all small jobs, the difference in cost is trifling and cement should be selected. Cement, also, is necessary in cases where bricks are to be used as a form of paving, or where they will be subjected to much damp. Taking all things into consideration, we advise the amateur to work with cement until he has formed very definite opinions as to the relative uses of each material.

Mixing Lime and Sand

These ingredients should not be tipped on to any rough piece of ground where all sorts of foreign matter, including garden loam, may be eventually mixed up into the mortar. A clean stretch of concrete or pavement serves best; but if these are not available, it is advisable to nail together a few rough planks and do the mixing on them. The extra trouble involved by this method is certainly worth while.

First, a definite quantity of sand is measured out—say, twelve pailfuls—and arranged in a fair-sized ring. If the sand is fine and of the right quality, it will need no sifting; but should it contain stones, even small ones, they must be removed by screening (i.e., sifting), because it is quite impossible to fit a brick in an exact position if the mortar, on which it is to rest, happens to contain a hard lump.

Inside the ring of sand, three pailfuls of blue lias lime are put. Thus the correct ingredients for lime mortar are

1 portion of lime to 3 of sand.

The lime will be in the form of lumps. To break it down or, in other words, to slake it, pour water slowly on it from a water-can provided with a rose. The lime will immediately begin to hiss, splutter, and give off clouds of steam.

The lime must not be touched with the hands or clothes, and the mixer must take care that none of the material splutters into his eyes while the steaming is going on, because it has a burning action. Children should be kept away from what to them is a highly interesting performance.

After about three-quarters of an hour the lime should have turned into a creamy paste, and all the lumps should have disappeared. It ought to be tested with a spade to see if it is pasty all through and not merely on the surface. If the spade causes further steam to rise, the slaking is not yet complete, a little more water may be needed, and more time allowed. On no account should the material be used before it is perfectly dead.

Then and not before, the outer edge of the ring of sand is spaded into the centre of the lime and this process is continued until all the sand is mixed up with the lime. Too much mixing is impossible. Water is, of course, added as required. The mixture should be about the consistency of a stiff cream. It is best to do all this a day or two before building operations are commenced. If this is done, the mortar must be churned up thoroughly, immediately before it is brought into use.

Mixing Cement and Sand

Here again the mixing must be done either on a concrete surface or a wooden board. First, a ring

of sand is made—say three pailfuls—and in the centre is deposited one pailful of cement. The proportions are

1 portion of cement to 3 of sand,

no matter what quantities are used. This will make up a good, hard mixture, suitable for most requirements. Some builders take as many as five parts of sand to one of cement when a weaker mixture will serve. Cement, mixed alone, is liable to flake, wear badly, and prove too costly.

While still dry, the sand and cement are mixed thoroughly, then the ring is re-formed and a little water is poured into the centre. With a spade some of the inner layers of the cement and sand are broken down so that they fall into the water. The mixing is continued in this way, a little at a time, but the ring is never broken through entirely until all the water is disposed of. Then the whole bulk is mixed thoroughly and used at once.

Note that cement must not be left for some days, as was suggested for lime. In fact, only sufficient ought to be prepared for a few hours' work. Should it become too stiff, a little added water will soften it, but the binding qualities are then slightly reduced. None ought to be left over from one day to another.

The Foundations

Every building must have its foundations, whether it be an American sky-scraper or an ordinary garden wall. How deep they need to be depends on how high the erection is to mount up, and the hardness of the soil. For a garden wall, there should be a depth of twelve inches below the ground level; for a garage or other similar building, eighteen or twenty inches. Where there are to be two floors, a ground floor and one above, the foundations must go still farther; but the amateur is not advised to under-

take such erections until he has gained a good deal of proficiency.

If the work is to be done well, the foundations should consist of a base of concrete and a certain number of brick courses, all of which will be hidden when the job is finished.

When the trench is dug and, let it be said, no more earth should be disturbed than is necessary, the surface must be beaten down to make it really firm, and it ought to be level. This latter is not so easy to do, as may be supposed, when the ground slopes. In such cases, the tilt of the land must be ignored and the bed of the trench determined by means of a spirit level. Note that the line of bricks will come along the centre of the trench. This fact must not be overlooked when the ground is measured out.

When building a "four-and-a-half inch" garden wall—that is to say, half a brick thick—the concrete bed ought to be about eighteen inches wide and six inches deep. For the first course, the bricks should be placed side by side so that they make a run nine inches thick. Subsequent courses should be composed of bricks put end to end, making the wall half a brick thick, as desired. This arrangement will provide a suitably strong foundation in this instance, but it will hardly serve for a garage.

For a garage, the foundations, as we said above, should be sunk to eighteen inches. A ten inch bed of concrete is advised, and it ought to be about twenty inches wide. Less, it is true, is often provided. On top of this, two courses of bricks, as described later, are arranged; and then the remaining courses are run up in whatever thickness is decided upon.

In the case of a small one storey garage, the walls will usually be strong enough if, after the first two courses have been laid, the bricks are put end to

end, that is to say half a brick thick. But should the walls be long and of average height, it will be well to make them one brick thick, or to adhere to the half brick thickness and provide outside buttresses at intervals.

For the brickwork that comes below the level of the ground, all the specimens that are awkwardly shaped or ugly in appearance should be chosen. But the plan followed by some builders of getting in a supply of old, soft bricks for the foundation is a bad one. Their argument that anything will do for the foundations, as they are out of sight, is quite wrong, since it is here that the greatest weight must be carried, and nothing but strong material will serve.

Concrete for Foundations

Concrete is made either with Portland cement or lime mortar, and the addition of broken material known as aggregate. *Ordinary lime must not be employed for positions where the air is excluded. Blue lias lime is essential here.* The broken matter consists of stones, broken bricks, old concrete fragments and, in fact, any hard material that is not wanted for better purposes. Say that, for the new building, the reader has had to pull down a piece of wall, clear away an old outhouse or dig up a patch of existing concrete. The débris, so acquired, will prove to be so much rubbish under ordinary circumstances. But put it carefully in a heap and crack it up into pieces no bigger than the lumps of stone used for macadamizing roads, and it serves admirably for the body of the concrete. Failing such a supply of aggregate, it is often possible to find suitable material by casting round the garden and collecting such things as broken tiles, old flower-pots, pieces of brick, large stones, etc. Concrete, in fact, helps splendidly to have a general "clear-up"; but there

must be no clay, mould, or other inferior matter included.

When a quantity of débris has been collected together and suitably broken, it should be mixed with cement and gravel, including any stones screened out of the sand used for the mortar, in the following proportions, reckoned by measure and not by weight:

1 part of Portland cement, 2 parts of sand and 4 parts of broken material.

This will make a very hard concrete, well able to stand a heavy weight and resist moisture. If the site is very dry and the weight to be carried is not considerable, a builder would use lime instead of cement, in order that the cost may be lessened. Then, the proportions would be

1 part of blue lias lime, properly slaked, and 4 parts of broken material.

Full particulars regarding the slaking have already been given under the heading, *Mixing Lime and Sand.*

Whatever ingredients are used, they must be well mixed, first in the dry condition, and then wetted, little by little, as the matter is turned over with the spade. Only towards the end of the turning-over process should the full quantity of water be added. The mixture ought to be placed in the trench at once, before it commences to set.

If the trench, made for the foundations, has been dug out just wide enough for the concrete bed, all that will be necessary is to tilt the wet mass into the space, relying on the sides of earth to hold the concrete in position. But amateurs do not find it an easy matter to shape the trench exactly as it should be, and, more often than not, they dig out too much earth at the sides. To fill up, then, with concrete would be very wasteful. Under such

circumstances planks should be arranged on edge to form the sides of the concrete bed, and the wet mixture shovelled into the space between them. After two or three days the planks are taken away and earth is rammed into the spaces at the sides.

So far we have said nothing about getting the top surface of the concrete level; but this is a matter that cannot be ignored because it is on this surface that the first course of bricks must be laid. *Unless the first course of bricks is horizontally true, no other course can be; which, of course, will prove fatal. Any error in this matter becomes magnified as the building rises upwards.*

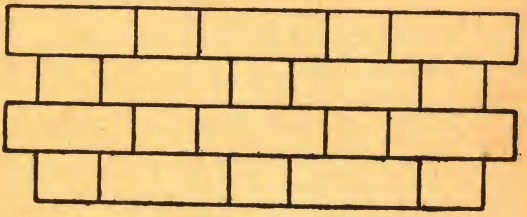
It is quite easy to ensure a level surface for the concrete if the following plan is adopted. A number of sticks or pegs, each about four inches long, are obtained and driven, here and there, some on each side, into the vertical faces of the trench, so that they project about one inch. They are fixed just where the top of the concrete is to come and all on the same level. The straight-edge of wood, referred to earlier, and a spirit level, will allow this to be done quite easily. When all the pegs are fixed, they show exactly where the surface of the concrete must be arranged.

Various Bonds

The average individual seldom takes much notice of brickwork: he knows that bricks are laid in an orderly manner, but that is all. Even a slight interest in the matter, however, will show that the face of one building has the bricks arranged in one way, whilst another building reveals them in a totally different disposition. The way they are arranged is termed the *bond*.

Two bonds are largely used in this country. The commonest is known as *Flemish Bond*, and consists of courses of bricks in which the ends and the sides

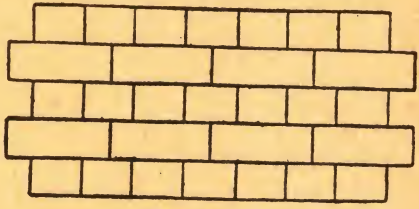
of the bricks come alternately—an end, a side, an end, a side, and so on. But no two successive courses are exactly alike. Immediately above an end-on brick in one course, is placed a side-on brick



FLEMISH BOND

in the course above it; and immediately above a side-on brick, in one course, is placed an end-on brick in the course above it.

English Bond is different. One course consists of all ends and the next course of all sides.



ENGLISH BOND

In both Flemish and English bonds, the arrangement is such that a joint between two bricks, in one course, never comes immediately over the joint between two bricks in the course below.

This rule must be carefully observed and never discarded. If ignored or the bond is broken, as

it is technically called, the wall will suffer from serious and unnecessary weakness.

Note that when the end of a brick shows in a wall it is spoken of as a "header"; when its side shows it is called a "stretcher." Thus, *Flemish Bond* may be described as headers and stretchers alternately along a course, the centre of a header being over the centre of a stretcher in the course below; while *English Bond* is one course of headers over a course of stretchers, the centre of the headers being over the centre and edges, alternately, of the stretchers in the course below. This explanation may be a little fidgety to follow, but if the diagrams are studied, the matter should become quite clear.

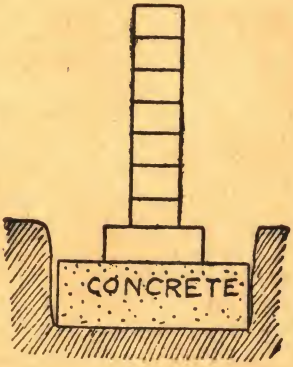
BOND USED FOR "FOUR-AND-A-HALF INCH" WALLS

A little thought will prove that both English and Flemish bonds are hardly suitable for walls less than one brick thick. If used for "four-and-a-half inch" walls, it would be necessary to halve every header that came into the construction, which would prove an endless task. For such walls, the bricks are all used side-on, so that they show as stretchers: but every alternate course will have to be commenced with a brick broken in halves, or, if there is to be a right angle bend at the end of the wall, instead of a half brick a whole brick is used as a header. Its longer face then acts as part of the wall which is round the corner.

Footings

In all well-planned buildings there are what are termed footings, coming between the concrete foundations and the walls proper. The footings are composed of bricks arranged on a wider base than the walls which they are intended to support.

For a "four-and-a-half inch" wall, in which the ordinary courses are formed of bricks placed end to end, the footings should be made of bricks arranged side by side. This will provide a base



Garden Wall, half a Brick Thick—Sectional View

twice as wide as the courses it will have to carry. These footings should always be a little longer than the normal courses of brickwork, because the end brick of the first course must not come right up to the edge of the footing bricks, as this would break the chief rule of bricklaying, were it to do so. The

joint at the end of the stretcher brick would come exactly over the joint of the second header brick, and a line of weakness would result.

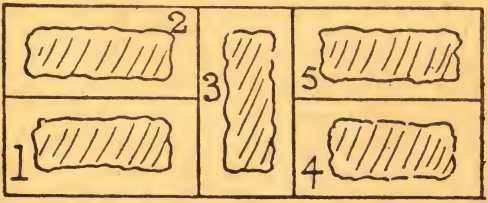
For a "nine inch" wall, the bricks in the footings can be arranged in various ways. There should be two courses of footing bricks if there is any considerable weight to carry. The lowest course may be made by putting down a double line of bricks side by side; whilst the second course consists of a run of bricks, side by side, with a line of bricks, end on, touching their header ends down one side. The second course should begin a quarter of a brick, or two and a quarter inches, from the edge of the first course, in order to obviate the trouble with superimposed joints.

Laying the Bricks

At last, the most fascinating part of the work is reached, namely, the actual laying of the bricks. There is nothing difficult about the job and, as long as the amateur is ready to take pains and not do things in a hurry, the building, when finished, should be strong and serviceable.

Having already dealt somewhat fully with the footings, we will suppose that we are now about to lay the first normal course. The position being carefully marked out, we commence at one end and spread out a bed of mortar with the trowel. A brick, which has previously been dipped in water to stop suction, is taken up and held with the "frog" side above. The frog is the depression on one of the major faces. The brick is turned round and round to find which is the best side to be displayed to view. Having decided, it is placed carefully in position and rapped sharply with the butt end of the trowel to get it well down on to its bed and, also, to force some of the mortar into the interstices. The first brick has been laid.

What follows depends upon what width of wall it is intended to erect and what bond is to be made. For the purpose of explanation it is proposed to have a nine inch wall and to do it in Flemish bond. Consequently, a return is made to the brick just laid, some mortar is dropped by the side of it and, with the trowel, the stretcher edge is coated with a generous covering of mortar. A second brick is taken, frog upwards and previously soaked in water, and it is laid truly by the side of brick No. 1. A wooden straight-edge should be run along



LOOKING DOWN ON THE FIRST FIVE BRICKS.

tne two short ends to see if they are flush. If they are not, a gentle tap with the end of the trowel will easily bring them into line. Then a few sharp raps on the upper face of the second brick will force it down properly into its bed of mortar. The second brick is laid.

For the third brick, more mortar is laid down as a bed and some of it is smeared on to the right hand ends of the fixed bricks, that is if the work is to proceed in a right-hand direction. The third brick is taken up, frog above and previously soaked, and its long side is placed against the two short ends of the fixed bricks. The straight-edge is put against one of its ends and the sides of the other bricks to see if the alignment is correct. A gentle

tap will bring it into proper position, if it is not already so, and then a few smart raps on the upper face will force it down well into the mortar bed. The third brick is also laid.

The fourth and fifth bricks are fixed in much the same way, their disposition being identical with those of the first and second.

In this way, it is possible to continue along the whole course, but, as a matter of fact, very few experienced builders do so. They put up two or three courses at the corner before proceeding right along the line.

THE WALL AS IT WILL APPEAR WHEN PORTIONS OF THE TWO ENDS ARE ERECTED. SIDE VIEW. IN PRACTICE, THE TWO ENDS WILL SELDOM BE RELATIVELY SO CLOSE TOGETHER.

Accordingly, it is best to return to the corner and lay the first brick of the second course. At this point some clear thinking is needed. Obviously, it will be wrong to begin with a stretcher brick, because the first course commenced with that, and the two rows must not be alike. What of a header? If a header is used to commence with, all will be well until a stretcher is laid beside it, and then it will be noticed that at the end of the stretcher on the second row there is a line immediately above the header of the first course. The bond is, therefore, broken. The correct thing to do is to begin the second course with a "closer," which is a brick cut in halves, longways. It is fixed at the com-

mencement of the row and followed with a header, then a stretcher. The bond will now continue correctly throughout (See diagram p. 28). The position of all these bricks must be checked on all sides by the straight-edge, and they should be rapped smartly with the trowel in order to bed them down firmly into position.

This forcing down action causes mortar to squeeze out of the sides. By smartly scraping the trowel along the lines of the joints, all this superfluous matter is quickly removed and returned to the board bearing the full supply.

By the side of this header, two stretchers are laid; then the second course is left and the third commenced. The third course must be identical with the first, so a start is made with a pair of stretchers, side by side.

At this point, the amateur picks up his kit, leaves this corner erection and transfers his attentions to the far end of the line, at the spot where the wall is to end. Here he repeats the process of building up a corner, but, of course, works to the left instead of to the right.

Having made the two corners, each a few bricks high, the next step is to fill in the courses. If the length of the wall under construction is at all long, it will be very easy to get out of alignment. So to guard against that, the bricklayer turns to his kit, gets out the line of string with a metal skewer at each end, and forces one of the points between the left hand end of the first and second courses, and inserts the other point between the far end of the same two courses. The string is then worked down the skewer, at both ends, until it just fails to touch the existing brickwork. If it has been drawn sufficiently tight, it serves as a guide line for each brick as it is laid along the course.

When the first course has been completed, the line is drawn from its moorings and refixed; but

this time between the second and third courses. And so the work proceeds, by adding three or four courses to each corner and then filling them in.

Note, particularly, that when a fresh course is commenced, the one below must be wetted, though not swamped, by means of a water-can fitted with a rose. If this is not done, the bricks that are set will draw the moisture out of the new layer of mortar and prevent it from binding properly.

The lowest courses are always the most tiring to do, because they necessitate much stooping and, probably, kneeling. It is when the erection mounts up to eight or ten courses that the work is less back-aching. This, however, does not last long, for the building soon grows up out of reach. The professional then brings scaffolding to his aid; but this form of luxury is denied the amateur, who must be satisfied with a pair of step ladders and a stout plank running between them. The only objection to this arrangement is that there is very little space for the loose bricks and mortar which are in use.

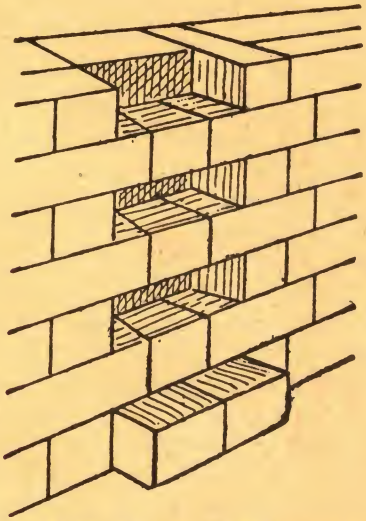
Connecting New Work to Old

So far, only the very simplest form of bricklaying has been discussed; but before the amateur has gone far, all sorts of little problems will arise, and the chief of these will be discussed in turn.

First of all, let us take the case of building a new wall at right angles to one already standing. Many amateurs, and some professionals, merely begin the courses flush against the old wall, depending on the mortar to make a suitable join. This is a bad plan because, after a time, there may be a settlement and the new construction will come away from the old, leaving a gap between the two. When this happens, there is a great loss of strength, and a high wind may blow down the structure.

Certainly, if heavy traffic continually passes close by there is a good chance of a nasty accident.

Under such circumstances the new structure ought to be tied to the old. This is done by knocking out some of the existing bricks and replacing them with new ones that will eventually form part of the new wall.



CONNECTING A NEW WALL AT RIGHT ANGLES TO AN EXISTING WALL

Mark, with chalk, two vertical lines on the existing structure where the new work is to join it. For the purposes of explanation, let us suppose that a nine inch wall is to be erected, and that the existing wall was carried out in Flemish bond.

The amateur looks at the space between the two vertical lines—they are, of course, nine inches apart.

Headers and stretchers are facing him. Probably, his first thought is to knock out the headers of each alternate course because they are apparently smaller to tackle. This is wrong. The headers go right through the wall to the other side, and to get them out would seriously weaken the old structure. What he must remove is a stretcher lying in each alternate course, just at the point where the new wall has to be tied.

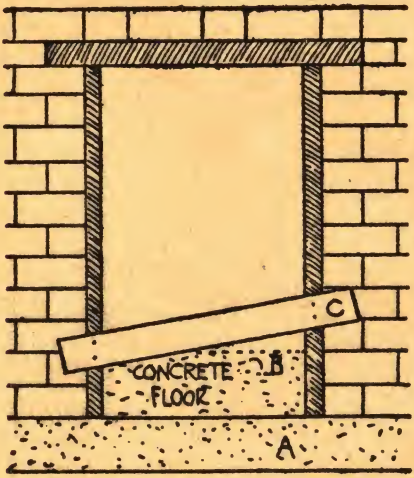
To knock out these bricks, a heavy chisel is used, and it must not be hoped to get them out intact. The only way is to smash them up and remove them in small pieces; but the hammering must not be done with such force that the wall will be unduly strained.

When one stretcher in each alternate course has been taken out, and all the mortar carefully cleared away from the recesses, the new bricks may be laid. The plan is to fit two bricks, side by side, in each recess that was formerly filled by one brick, lying stretcher-wise. The new bricks will be end on and half of each will project, the hidden halves being carefully surrounded with mortar and held firm. Naturally, work is begun on the bottom course, and every alternate course is started with a brick placed flush with the old wall. A join such as this is strong and not liable to part company at the angle, even when the strain is great.

Fitting Doors and Windows

Every building must be provided with a doorway, and most require one or more windows. The question is, "How are they to be fitted?" Let us take first the case of a garage doorway. Probably the reader will elect to buy the door ready-made, because it can be obtained at almost the same cost as the wood from which it is constructed. Often a serviceable second-hand door can be procured for

even less. But the frame around the door is a job for the amateur to undertake. It is not difficult to make, since it merely consists of two uprights and a cross-piece. It will make matters easy if the wood selected for this purpose is at least as wide as the thickness of the wall to be erected, and



BUILDING AROUND A DOORWAY. A IS THE CONCRETE BED THE DOTTED LINE B IS THE GROUND LEVEL; WHILE C IS A TEMPORARY STRIP OF WOOD TO HOLD THE UPRIGHTS SQUARE.

of sufficient thickness to carry a considerable weight. In other words, it should not bend.

The two uprights ought, for preference, to be sunk in the ground. This will add to their strength. As the foundations will probably be continued right along, under the doorway, it will be convenient to

rest the two uprights on them. Then the cross-piece should be fixed, using a spirit level to get it perfectly horizontal. It is preferable to carry this cross-bar the length of one brick, or half a brick, beyond the uprights on either side. This plan helps to key the doorway to the brickwork.

It is a good plan to fix a temporary piece of wood to join up the two lower ends of the uprights. This will keep them in position while the bricks are being fitted around them.

Windows are fixed in a slightly different manner. The easiest way is to run up a certain number of brick courses and then to rest the frame where it is required, holding it in position by some temporary lengths of wood. The brick courses are continued up the side of the window until they reach to the top. The making of the frame is dealt with in *Practical Carpentry for Amateurs*, one of the volumes in the present series.

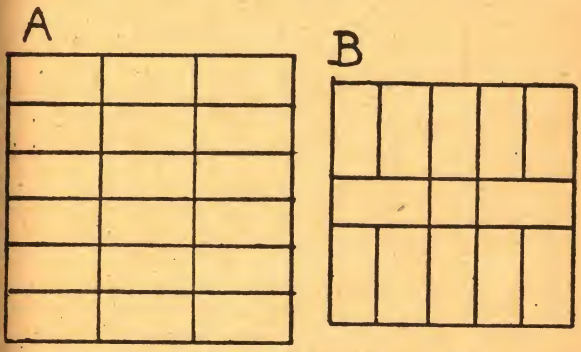
It is the top that will prove troublesome, since something must be provided to take the weight of the bricks above. In buildings which rise up two or three floors, a brick arch must be provided and the bricks should be shaped and keyed. But with a one-storey building, such as a garage, the weight above the window is not great, and a length of timber, placed across the top of the window frame, will be quite suitable. This length should be as wide as the walls and ought, for preference, to be continued nine or four-and-a-half inches beyond the frame, on either side.

If a stone sill is to be fitted to the window-frame, it should stand out from two to three inches beyond the face of the brickwork. Fixing is done with cement. The work should not be undertaken until a fortnight has elapsed after the bricks were laid. If done at the same time, there is a fear that the stone may crack, due to a possible slight settlement of the whole structure.

Building a Square Pillar

The amateur builder will not have been long at the work before he finds that he has to build a brick pillar. It may be required to serve as an end-piece of a wall, to support a loggia-roof, to hold up a beam, or, with another, to stand at the entrance of the garden drive.

For any of these purposes, the pillar may reasonably be made thirteen and a half inches square and as high as desired. To put up such an erection, a beginning is made by digging out a space forty



The Left-Hand Diagram (A) shows the First Course of Footings, consisting of Eighteen Bricks. The Right-Hand Diagram (B) represents the Second Course of Footings. The Second is Laid Centrally over the First.

inches square and thirty inches in depth. A bed of concrete is arranged in this, twelve inches thick. On top, come three courses of brick footings.

The first course of footings consists of eighteen bricks arranged in three rows of six. In each row, the long sides touch as shown in diagram A.

The second course of footings is not quite so simple. A half brick is placed in the centre, and at each end two other bricks are arranged, the header faces touching. Along the stretcher faces, on both sides, five more bricks are placed, end on. See diagram B.

The third course of footings is composed of eight bricks, arranged in two rows of four. In both rows the long sides touch, as shown in diagram C.

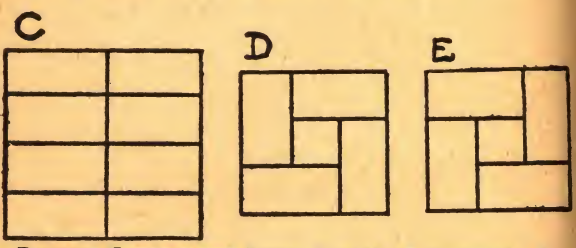


DIAGRAM C SHOWS THE THIRD COURSE OF FOOTINGS. D AND E REPRESENT THE FIRST AND SECOND COURSES ABOVE THE GROUND. THE LATTER ARE REPEATED ALTERNATELY THROUGHOUT THE HEIGHT OF THE PILLAR.

Each course above the ground is formed with four whole bricks and half a brick. The half is placed in the centre and the four are arranged around it. The arrangement is such that every face of the pillar shows a header and stretcher for one course, and a stretcher and header for the next. See diagrams D and E.

The pillar is finished off by placing, on the top, a slab of stone, and fastening it with cement, or by artistically arranging bricks placed on end.

CUTTING BRICKS

As far as possible the amateur should endeavour to use whole bricks for his work, but it is manifest

that he will not be able to do so always. The length of a course of bricks is not necessarily a given multiple of any of the dimensions of an ordinary brick. When it is not, the only thing is to make up the line with portions.

To watch an experienced man crack a brick in halves, gives one the impression that it is the easiest thing in the world. He holds the brick lightly in the left hand and gives it a smart, ringing slice with the edge of the trowel, and the thing falls into two perfect halves. But let the reader try it for himself and see. More than likely, he will merely knock off one of the corners.

A far better plan for the novice, is to take an old chopper or hatchet and put it on the brick just where it is to be broken. Then strike the thick end of the chopper with a hammer, and a good cut will be made. In this way, it is possible to get portions of bricks exactly the size required

Pointing

While bricks are being laid, it is usual to pay very little attention to the mortar which shows in the joints. The builder spends all his efforts in getting the bricks in proper position. But if a structure were left with the joints in their rough condition, the effect would be very amateurish. In addition, the uneven lines would harbour wet, and the mortar would disintegrate in a very few years. To obliterate these defects, a wall is pointed after it is built. That is to say, the spaces between the bricks are filled up level with a suitable material.

For this purpose ordinary cement and sand can be used, but it must not be too wet. This makes a very durable joint, and its only drawback is that it looks rather cold. More often, a mixture is made up of

1 *portion of lime and two of fine sand,*

with sufficient water to make a stiff mortar. Occasionally, powdered ashes are added to give the mortar a bluish colour; but this is by no means necessary.

The pointing is commenced at the top course of the building and the work proceeds downwards. First, it is necessary to rake out the rough edges of the mortar, and then to brush water over the faces of the bricks in order to prevent too much suction. *Note particularly, however, that the raking must be carried out as the bricks are laid, if cement is used when building, as it hardens very rapidly.* Some of the mixture is now placed on the hawk, and then with a small trowel, the joints are filled up and levelled.

The hawk not only serves to carry the supply of mortar but, as it is straight along its edges, it is convenient to hold it against the brickwork, a trifle below the line being pointed, so that any portions of the wet mixture which fall away from the trowel are caught by the board.

A good workman forces the mortar into the joints without smearing the bricks. He uses the material in a fairly stiff condition; but if it is very stiff, it will dry too quickly and consequently not hold. If it is too wet, it will run about the place, will fall out of the joints the moment it is pushed into position, and certainly find its way on to the faces of the bricks. The appearance, then, will be very untidy.

Workman call the above, *flat pointing;* but they use a second kind, known as *tuck pointing*, when they wish to make a neat job of the brickwork. We are not certain that tuck pointing is worth all the trouble it involves. It is very difficult to do well and looks clumsy when done badly. Moreover, it is condemned by many experts.

Tuck pointing consists in filling up the joints in the ordinary way, and then running a white line

down the centre of the joints. This line, when thrown into relief by the bluish tint of the wider expanse of mortar around it, is very effective.

The white line is obtained by using what is known as *plasterer's putty*. To prepare it, place some slaked lime in a bucket and add enough water to make a liquid cream. Leave for two or three days, or even longer, and then pour off any water that may be floating on the surface of the jelly. It is the jelly or thick cream which is used.

The putty is spread along the mortar joints, a yard or two at a time, then, with a straight-edge of wood placed against the bricks to act as a ruler, a pointed knife is run through the putty to define the edge of the white line. This is done on both sides of the line of putty. Finally, the superfluous material is scraped away up to the straight lines.

Pointing Old Brickwork

It frequently happens, when a fresh run of brickwork is added to a piece that has long been in existence, that the old structure appears very dilapidated by contrast with the new. When this is the case, the amateur may wonder what can be done to give the whole of the brickwork a less patchwork appearance.

First scrape away the decaying mortar, between the joints, with an old screw-driver or any metal pointed article. This is a very dirty job, so old clothes are called for, a hat or cap should be worn, and windows and doors, near at hand, must be kept closed.

When all the joints have been raked clean, it may be necessary to brush the bricks vigorously with a garden broom. As often as not it is advisable to wash down the walls with a hose pipe. If the bricks are very old and much discoloured, it is a good plan to rub them over with a clean, new brick

which is smooth and fairly soft. In this way, the old and dirty faces are worn away and a new surface, equal in appearance to new bricks, is obtained. Then, if the old work is still unsatisfactory, or a really smart effect is wanted, apply a wash made by mixing ochre for yellow bricks, or powdered red for red bricks, in a solution of copperas. It is put on with a whitewash brush. When the colour has set, the bricks are pointed, as described under the previous heading.

Damp Courses

Bricks are highly porous, and suck up moisture readily. As a result of this property, the moisture in the ground will find its way up into a building unless something is done to arrest its flow. This tendency is considerable and, in practice, more moisture will work up from the earth than will beat through the faces of the bricks in wet weather.

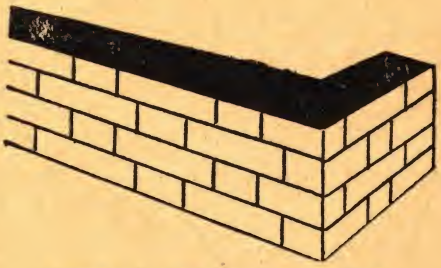
Fortunately there are various simple measures which will arrest entirely the upward movement of dampness, and one or other of them must certainly be applied in any building which may be erected. Undertaken while the building is in course of erection, they are easily and cheaply applied; but, if left till afterwards, they prove a costly and unsatisfactory business.

The garage, without some form of damp excluder, will strike one as being chilly; to breathe the air in it may lead to colds, the metal parts of the car will be everlastingly dull, and the engine will prove a constant source of trouble when starting-up. Of course, if a living room is in question, the danger will be far greater.

The way to stop the damp rising from the soil is to provide a damp course. This is a layer of material through which wet cannot pass. Obviously, if the check is to be a hundred per cent. effective,

it must be applied to every particle of the course chosen for it. Even if it covers nearly all, but not quite all, of the course, its object is partially defeated, for moisture will surely find out the weak spots and rise up the walls through them.

Another important point depends on the selection of the proper position for the application. Clearly, it is no use putting the damp course below the level of the ground, while to put it too high would mean that much of the wall-area would still be attacked.



A Damp Course Provided by Tar

All things considered, it will be found that a damp course should come between the first and second brick courses that are above the ground level.

A very simple form of damp course is to apply three or four successive coats of hot tar to cover completely the bricks that form the first course above the ground. As soon as the last coat is put on, the bricks of the second course are laid, and then the ordinary work of laying the bricks is proceeded with, as usual.

But tar in quantities is not always easy to handle; moreover, it must be used hot, and heating tar is sometimes a dangerous business. Consequently, an alternative method may be desired. Such a one is to use slates. They must be arranged to cover

every particle of the course, and the fixing is done with cement. Professional builders generally lay the second and third courses of bricks in cement, for purposes of stability, even when lime is used for the higher courses.

A slate course is slightly better than a tar course, because the latter may occasionally squeeze out at the sides through the pressure above. On one occasion it happened that a newly built house was very damp. Upon examination, it was found that practically all the tar had been pressed out, and there was only just sufficient left to prove that it had not been omitted altogether.

Instead of tar, asphalt is used occasionally; but it possesses the same drawbacks. Recently there has been put on the market a new preparation called *Pitchaline*. It is a composition of fabric and tar, which is applied without the slightest trouble. While being thoroughly satisfactory in withstanding damp, it is cheap and, consequently, has been used to a large extent in the erection of the smaller houses of which so many have been built recently.

The best damp course of all is provided by laying one run of glazed earthenware bricks instead of ordinary bricks, using them as the second course above the ground. The only drawback is that they are expensive, but its extra cost is fully justified in most cases.

Damp Walls

Though a damp course prevents wet rising up from the ground, it is no check to moisture which may find its way through the sides of the walls. "Prevention," the maxim says, "is better than cure;" therefore, the wise amateur builder will buy good, hard bricks for his work, and not save a few shillings by getting soft ones which will prove to be a perfect highway for rain-water.

The importance of selecting good supplies for the work cannot be over-emphasised. To pick up a job lot of bricks at a bargain price is often a dangerous procedure, as the following incident will show. A builder, of the author's acquaintance, was about to erect a house. He cast around and came upon many thousands of bricks at a ridiculously cheap rate. He bought them and soon finished the house. At first, the house was very wet; but that was not unusual. Ever afterwards, however, it was and still is thoroughly damp; so much so that nobody could account for it until, one day, it was discovered that a barge had sunk while carrying the bricks from one port to another; but the cargo was salved. The sea-water impregnated the bricks and the salt, which will remain in them for ever, attracts moisture whenever there is any in the atmosphere—which is always.

Should a house be ordinarily damp, a good deal can be done to improve it by pointing the outer faces of the bricks, as already described. Cement, in such cases, will be much better than lime mortar.

Another plan is to coat the outside brickwork with hot tar. Appearances, however, are against this method and, on that account, it is not recommended, except for the brick courses coming below the ground level. Then it is an admirable preventive of damp, if used in conjunction with an ordinary damp course.

Better than tar, as far as appearance is concerned, is a thin coating of cement. Use three parts of well sifted sand, one of Portland cement, and add water to make a stiff paste. Wet the wall thoroughly and apply the coating half an inch thick. A large, ordinary trowel should be used, or, better still, a laying trowel that has a rectangular face, with the handle fitted to the back of it. Do not mix up too much cement at once; apply a thin skin at a time, and leave the surface rough until it is nearly hard; then

add another skin. Build up in this way until the required thickness is obtained.

When a wall is unduly damp on the inner surface, perhaps through an outside gutter having become defective, it is advisable to cover the plaster with a solution made of

¼ lb. of shellac and 1 quart of naphtha.

This dries flint-hard in an hour, and then no more moisture can soak through. The only objection is that a most unpleasant smell, caused by the naphtha, fills the room for a matter of a week or more.

Air Bricks

Although a garage should be built, preferably, with a solid floor, it may be necessary for the amateur to use a cavity floor upon other occasions.

Whenever a space exists beneath the ground floor, it is necessary to find some way of ventilating this space. If no means of ventilation is provided, and the space is entirely shut in, fungus will thrive, the imprisoned air will become foul, and the timber will probably rot.

The easiest way of providing ventilation is to fix two air bricks, one in each side of the building. Air will then be able to circulate through the space and prevent damp and rot.

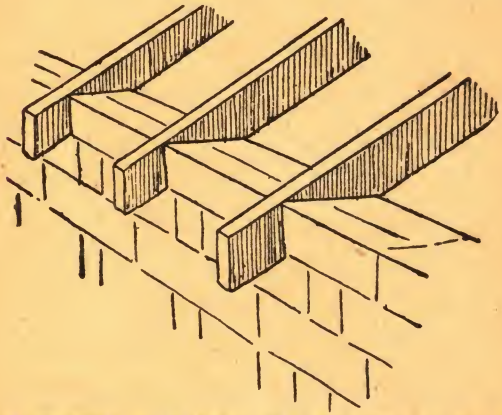
There are several kinds of ventilators. The most useful is an earthenware air brick, exactly the same shape as ordinary bricks, but perforated with tubular holes. Another kind is an iron plate, also perforated. It is made 8¾ inches long and two and three-quarter inches wide, so that it may be fixed in the place of an ordinary brick.

The Garage Roof

Though it is a little outside the scope of bricklaying, we will now give a few elementary hints on

how to build a garage roof, in order that those readers who have followed the instructions especially with a view to erecting a home for their car may not be left without a roof, so to speak, over their heads. Of course, the information will serve equally well for a shed, an outhouse, or any small one-story building.

The roofs which will interest the amateur builder are of two types, known as the *lean-to* and the *span*.

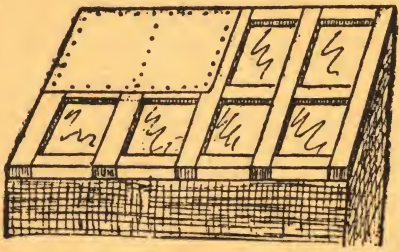


ARRANGEMENT OF RAFTERS IN TOP COURSE OF BRICKS

The Lean-to Roof is the easier to construct. In preparation for it, one of the long walls must be carried up higher than the wall opposite to it, while the side walls should slope from the higher to the lower wall. The slope should not be more then forty-five degrees nor less than about twenty-five degrees.

The simplest way to set about the work is to fit a piece of timber to run the whole length of each of the long walls. These are rested on the last brick course, and nailed firmly in position. Then

rafters are arranged, sloping and parallel, from the higher wall to the lower. Their thickness is determined by the length of span. For an average garage,



ROOF ARRANGED FOR ASBESTOS SHEETING, WITH ONE SHEET IN POSITION

timber measuring four by two inches will be suitable. Another plan is to arrange the rafters so that they break into the uppermost course of the bricks, as shown in the diagram on page 45.

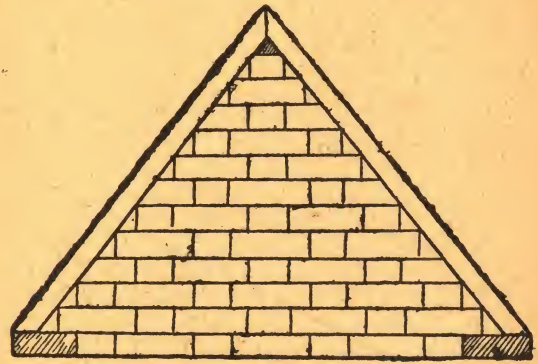
A little thought will make it clear that the tilt of the rafters will be such that they will not lie flat on the wall-plates. In order that they may be given a firm bedding, each will have to be cut so that it may lie snugly. Nailing is then possible.

The next step depends on what form of roof-covering is to be provided. If feather-edged weather-boarding is going to be used, no other skeleton supports are needed. The boards are laid horizontally on the rafters, beginning at the lowest part and working upwards, each being slightly lapped. Such a roof is easy to construct, and looks well; but it has the objection that rain-water can blow through the cracks and drip on to the car.

Should tarred felt be decided on, the cross supports already supplied will, again, be sufficient. Boards are laid flush and horizontally across the roof, and the felt is put on as a covering, care being taken to

tuck it well under at the edges. This makes a good, dry roof; but it is not fire-proof, and this is an important point to consider.

If asbestos sheeting is selected, it is probable that cross pieces of timber will have to be laid over the rafters wherever the material has to be joined. Note that nails should not be driven through asbestos sheeting until the holes have been made with a brace and bit. Otherwise, it is liable to fracture. This

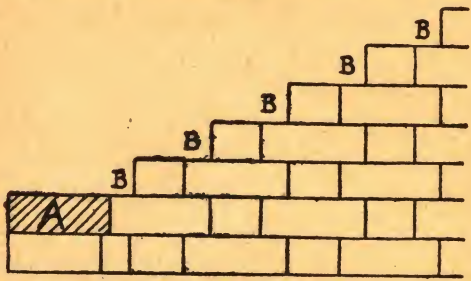


SPAN ROOF, SHOWING A PAIR OF END RAFTERS. THE SHADED PORTIONS INDICATE THE TIMBER WALL PLATES AND RIDGE RAFTER.

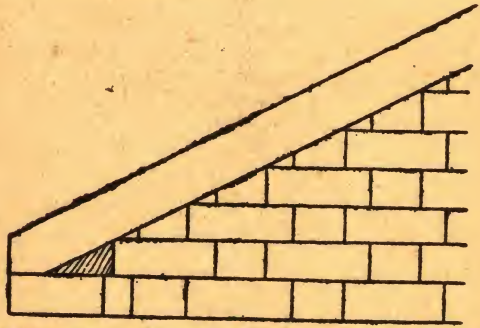
is, probably, the best all-round material to use. It is not expensive, it is fire-proof, it is readily fitted, and can be made quite weather resisting.

The Span Roof is erected in much the same way as the lean-to, but the work is doubled, because there is not one slope, but two. In this case the two long walls are built to the same height, but the end walls are carried up to a point. Joining the two points, a ridge-board is fixed, and the rafters

are placed in pairs, one sloping down each side; these are butted together at the top.



ARRANGEMENT OF THE BRICKWORK, SHOWING THE UPPER PART READY TO TAKE A LEAN-TO ROOF. A IS THE TIMBER EDGING OF THE WALL PLATE. FOR A SPAN-ROOF, THE RIGHT HAND SIDE IS THE REVERSE OF THE ABOVE ARRANGEMENT.



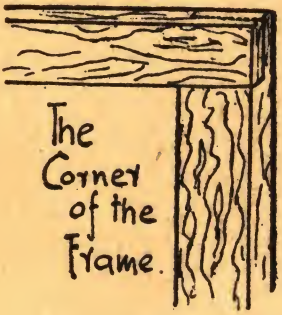
THE END OF THE LEAN-TO ROOF WITH FINISHING BOARD IN POSITION

Whether a lean-to or span roof is provided, it will be found that, where the timbers join the brickwork, a rather unfinished effect is produced. The

spaces marked B in the upper diagram on page 48 are filled with broken portions of brick or with mortar, and they will be difficult to finish off well. The remedy consists in nailing a fairly light board all round the roof, as shown in the second diagram on same page. This will add to the appearance, and serve to carry the rain-water gutter, if one is thought necessary.

Other Garage Details

If windows are to be fitted, they should be the minimum required for giving the necessary light,



since the more glass space, the colder will be the garage in winter, and the hotter in summer. Do not fit skylights, as these are apt to leak and let water fall on the car.

Windows. A second-hand window, in good condition, can be bought from any housebreaker for a very small sum. If one has to be made, let it be of the fixed kind. Make a frame, of wood four inches by one inch, using the halved joint to strengthen the corners. Upon this nail a second frame, made

of wood three inches by one inch. The outer edges of both frames should coincide, and as the wood in one case is an inch narrower than in the other, there will be an inch recess all round the inner edge of the frame work. In this recess the sheets of glass are bedded.

Should the space inside the frame be too large for one sheet of glass, the best plan will be to divide it into two, three, or four sections, side by side. The

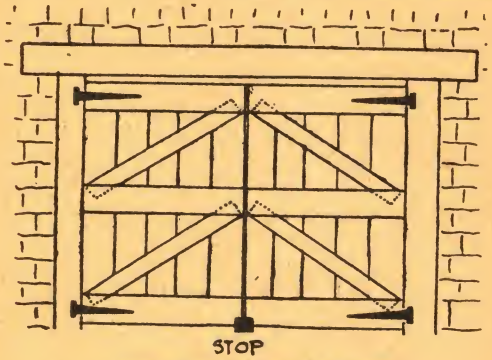
A Partition for the Glass Panes

number of sections depends, of course, upon the size of the window. The parting rails, for this purpose, can be easily made by cutting laths, two inches by one inch, and the exact length of the distance between the two long sides of the window frame. Upon these laths nail, centrally, a strip of wood, half by half an inch; but the length must be two inches longer than the laths. If an inch projects

at both ends of a lath, the rail can be fixed, quite easily, to the window frame.

Do not insert the glass until the frame has been built into the wall. Then run a thin bed of putty all round the pane recesses, put in the glass, run in a brad or two at each side, and finish off with a smooth fillet of putty.

Doors. A pair of folding doors are, generally, more serviceable than one large door. Wood one inch thick should be used. The boards should be

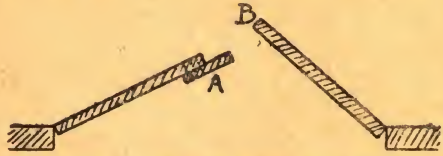


INNER SIDE OF GARAGE DOORS

arranged side by side, vertically, and held together by three cross pieces, nailed or screwed, horizontally, on the inner side. In addition, there must be two diagonal strips running between the horizontal boards.

For hinges, it is advisable to use those known as the pin and strap type. They are much better than the common "cross garnets," which most people use. A strong bolt is needed, both top and bottom, on the inside of one door; and some form of lock, which can be worked from both outside and inside, on the other door.

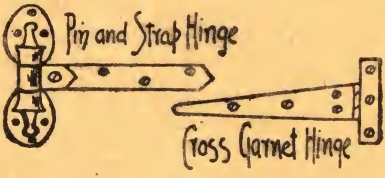
Floor.—Nothing is better for the garage floor than concrete. It is provided in the manner described under the heading *Concrete Paths*. Standing up from the floor, centrally in the doorway, must be a wooden stop for the pair of doors. Other volumes in this



GARAGE DOORS. NOTE THE EDGE, MARKED A, AGAINST WHICH THE EDGE B RESTS WHEN THE DOORS ARE CLOSED.

series should be consulted on matters dealing with lighting the garage by electricity, painting and distempering the garage, and fitting the garage with a work bench.

Note that if the garage floor is slightly raised above the outside ground level, the threshold must be gently sloped, so that a car may enter without an unpleasant jerk.

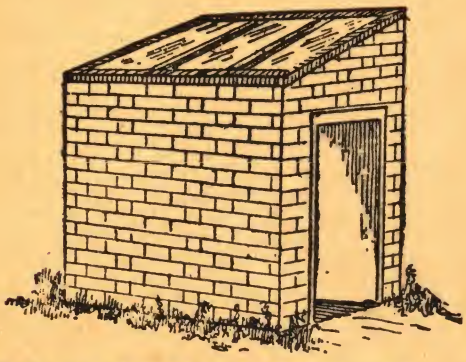


COAL SHED AND FORCING FRAME

The amateur bricklayer will find that there are many useful small buildings which he can erect with fair ease. The diagram, p. 53, illustrates a novel idea for a combined coal shed and forcing frame. As a rule, a coal shed is an unsightly building,

tolerated only because it is a necessity. In the present case, it has ornamental pretentions, and serves a double purpose.

This erection is put up on the lines already described in detail. The only point to note is that, a few inches above the top of the door, cross rafters of wood are laid horizontally as the bricklaying proceeds. About four such rafters are required; one at each end, and the remaining two at equal distances between. Resting on these rafters are stout sheets of asbestos,



A Novel Idea for the Amateur Bricklayer. A Coal Shed with a Forcing Frame fitted to the Roof.

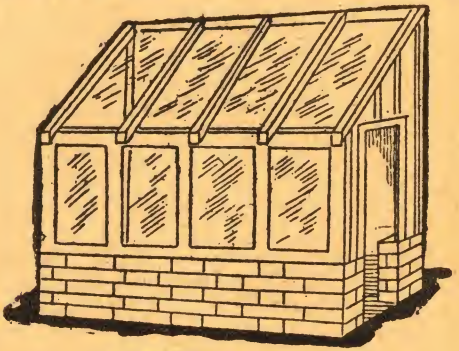
nailed or cemented together. They serve not only as the roof of the coal shed, but as the floor of the forcing frame.

Motor-Cycle Shed

A shed for a motor-cycle, with or without a side-car, is probably one of the easiest things the amateur bricklayer can build. It can be put up on the lines of the coal shed and forcing frame, just described,

but with the asbestos partition omitted. The window of the forcing frame could be used as a sky-light; but, as previously stated, this is not advisable, as roof-windows are apt to leak on to the motor below. A better plan would be to use the asbestos sheeting for the roof, and to put the window in the largest wall, as described at length in the case of garages.

Suitable dimensions for a motor cycle shed depend on the machine to be housed. Take the over-all dimensions, and add at least a foot to the length and breadth. Where space is not restricted, add three feet to the width and six feet to the length.



A Lean-To Greenhouse

Greenhouse

Another erection which the amateur bricklayer may well undertake is a greenhouse. A useful type is illustrated. The brickwork should be run up for five or six courses above the ground level, and the remainder consists of a wooden skeleton frame, filled in with glass. *Practical Carpentry*, a volume in the present series, deals with this construction in detail.

Breeze Blocks

At one time, houses were seldom other than brick built. Since the War, many new materials have come into favour, and the breeze block is one of them. These blocks are a form of artificial stone which is very durable and by no means costly. They serve admirably for the outside walls of small garages and sheds, partition walls, and for such things as the door posts fitted to the garage entrance. It is clear, then, that they should prove of much interest to the amateur.

Breeze blocks can be bought in certain standard sizes at a cheap rate. Also, it is not difficult to make them, if a little care is expended. First, a number of moulds is necessary. These are lidless boxes, the inner dimensions of which are exactly those of the required blocks. It takes about three days for a block to set hard, and, as it must remain in the box all the while, it is clear that a large number of moulds will be required if any quantity of building is to be done in coke breeze.

The blocks are made by mixing

> 1 *part of Portland cement,* 2 *parts of sand,* 5 *parts of coke cinder, and sufficient water to make a wet mixture.*

The coke cinder must be fine, and all the ingredients should be well mixed. Then it is ready for putting into the moulds. The final step is to smooth the surface level with the top of the mould. It should not be necessary to break the wooden casing when taking out the cast.

There should be no trouble in fixing a breeze block either to a second block or to brickwork. It should be stood on a line of cement, the edges coated with more cement, and so on until the particular wall or section is completed.

Concrete Walls

A method of building which has only recently come into favour is to build in concrete. It is a very simple process for unbroken runs; that is to say, for garden walls or sheds not requiring windows and other such openings. In the case of a garage, it may be used with advantage up to about five feet high—the rest of the erection being completed in bricks.

The foundation is carried out in the usual way, but it need not be wider below the ground level, than the wall is above it, largely because the erection is to be in one solid piece instead of a combination of separate bricks.

When the foundations have set hard, a number of boards are placed on edge in pairs, with a space of nine inches between them. They are arranged in this way all round the foundations, and the space they enclose should be equal to the area of two or three brick courses. Adjacent to them on the outside, tall wooden uprights are forced, at intervals, into the ground and the boards are firmly nailed to them. Then a second tier of boards is arranged on top of the first, and a third tier on top of the second. Where there are end openings, small boards are put to block them up.

Concrete is now mixed, using

1 part of Portland cement, 2 parts of sand and 4 parts of broken material.

This is shovelled into the space between the boards, and well rammed into the corners. The surface is left as rough as possible.

After three or four days the mass will have dried hard, and then it is ready for the second application. The two lower tiers of boards are loosened and placed above the third tier, which must remain fixed. This

is a subterfuge to permit of the job being done with the minimum number of boards.

More concrete is made up and shovelled into the new cavity. In this way the wall is continued until it reaches the required height.

One thing only remains to be said. Before a new layer of concrete is put in, the old surface must be roughened up by using a heavy chisel and hammer, or by any other suitable means, and water thrown over it.

Crazy Walls

A wall need not be a formal erection of brick-work or concrete. We have crazy paths, so why not crazy walls? To make one of these, dig out the foundations in the usual way and then take whatever material is available, such as broken paving slabs, masses of clinker, broken masonry, etc., and erect it in a manner that appears to be lacking in method, but which is, in reality, well thought out. The art consists in arranging the fragments so that they stand up and add to the height of the wall as much as possible, consistent with strength. The base, of course, should be the widest part, and the width ought to taper off as the wall mounts up. The various pieces should almost stand of their own account, the cement being used as an extra precaution. All pieces must be thoroughly soaked before the cement is applied to them.

Concrete Paths

If a garage has been built, it will be worthy of a good run up to it from the roadway. If an ordinary sanded path is provided, the wheels will churn up the surface in the wet weather and it will require constant attention.

There are two good surfaces, however, which can be laid without any great trouble. The first is provided by concrete. For this the limits of the path must be pegged out and the surface soil dug away to a depth of nine or ten inches. As this job should not be done until the garage is finished, it is probable that an accumulation of much hard rubbish —broken bricks, solidified particles of cement, mortar, and so on, will be available. All these will come in very handy. Throw them into the excavated pathway and fill it up to a level of about six or seven inches. Run over the mass with the garden roller, to press it down firmly.

Now, make up some watery cement by using

1 portion of cement, 7 of sand, and plenty of water.

It will be best to mix it in a bucket or tub. Then pour the cement evenly over the aggregate and brush it in with a broom. Leave it for two or three days to harden.

The second stage consists in erecting boards, on edge, along the side of the path, so that their uppermost edges come at exactly the required level of the final surface. It is a good plan also to run laths *across* the path, every three feet, at the required level of the final surface. This will have the effect of cutting up the path into sections, and so minimising subsequent cracking.

A quantity of mortar is now made, taking

1 portion of cement, 4 of sand, and sufficient water to make a stiff cream.

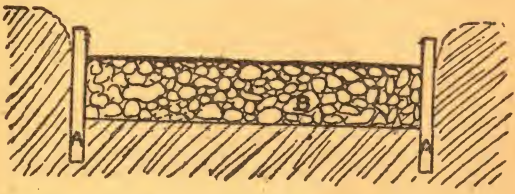
This is put over the old surface, but not quite up to the sides of the boards. The top is left fairly rough.

Finally, more mortar is made, by using

1 part of cement to 4 parts of sand,

and spreading it evenly over the path. As this is the final surface, it must be levelled carefully. There is no better way of doing this than using a long straight-edge of wood and drawing it over the cement, with its ends always resting on some part of the framing boards.

At the end of a week the path should have completely hardened. The cross laths are then picked out, and the spaces filled in with cement by means of a trowel.



CONCRETE ROADWAY. AA ARE SIDE-BOARDS AND B IS CONCRETE. IT NOW REMAINS TO FILL UP TO THE TOP OF THE BOARDS WITH CEMENT.

Concrete paths, such as we have just described, are suitable for hard wear; they are clean and they are not costly. They have, however, a rather cold appearance. If objected to on this score, an excellent alternative is tar paving.

TAR PAVING

The process of laying is quite simple; but it is a messy job. The foundations are dug out and rammed with aggregate, as for concrete, then hot tar is run over the material to bind it.

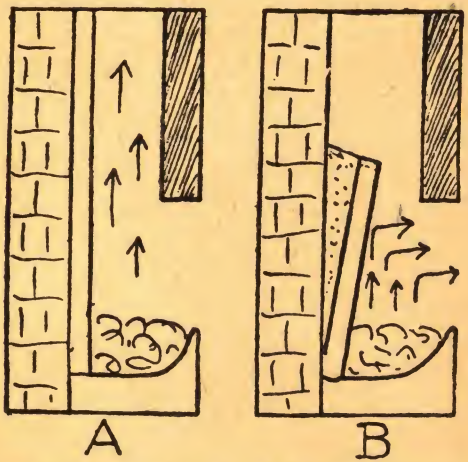
The second coat is made by forking together shingle and hot tar, and rolling it down firmly over the aggregate bed. If the roller picks up the material,

sprinkle the surface occasionally with dry sand, and wet the roller.

The top or final coat is made by mixing fine sand and pulverised ashes, in any proportion, with just enough tar to bind. When this has been rolled in and carefully levelled, a dusting of sand is thrown over the surface and the roller used once more.

IMPROVING A FIRE-GRATE

Anything that will save part of the coal bill, in these days of high prices, is well worth considering. Yet many fire-grates are still fitted with the old-



A SHOWS A WASTEFUL GRATE. B GIVES THE TRANSFORMED ECONOMICAL GRATE.

fashioned upright back bricks. With them, at least fifty per cent. of the heat goes up the chimney and is lost.

The diagram shows (A) a fire-grate with the wasteful back brick, and (B) the same grate altered

to burn economically. It is by no means a difficult matter to transform the first into the second, and the cost is quickly outweighed by the saving in coal. The job, it is true, is a rather dirty one; but that is a small matter. The work should be done in the Summer time, for preference, because then the grate can be allowed to stand a considerable while, in order that it may harden before any fire is lighted in it.

First, get out the old fire-bricks which form the back and sides of the grate, and then procure some new ones. Fire-bricks can be bought in various sizes and shapes, and the selection of the new ones must depend on the particular grate under consideration.

The back brick should be fitted first, being given a forward tilt of about seventy degrees. Although it must be cemented in position, the cement should not be depended upon alone. The side bricks (not shown in the diagram) are stood vertically and should wedge it, thus providing additional support from falling forward. One more point must be noted: the back brick should extend above the base of the metal canopy at the front, in order to prevent the smoke from coming out into the room.

No space must be left behind the fire bricks; any that may occur in the fitting should be filled in. Do not use Portland cement for the work, as it will not stand the heat. Fireclay must be employed. The fire-bricks are first thoroughly wetted, and so are the stock bricks behind; then the fireclay is kneaded to a plastic dough and used in the manner of ordinary cement.